Duncan Devaud Smith

Current Position

Research Associate
University of Wisconsin - Madison
Department of Botany
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Education

Doctorate	University of Utah 2009 - 2015 Department of Biology Advisor: John Sperry
Bachelor's	University of Utah 2004-2008 Biology BS with Chemistry and Anthropology minors

Research interests

Modeling plant structure and function with emphasis on optimality
Physiological limits of plants imposed by hydraulic transport

Teaching experience

I have served as a teaching assistant for the following courses: Plant Form & Function; Ecosystem Ecology; Field Botany; Plant Ecology in a Changing World; and Plant Systematics.

Research experience

Graduate	Testing a model prediction that narrow crown architecture affords plants greater biomechanical safety or increased height growth Studying whether leaf area partitioning optimizes resource acquisition Investigating the coordination of xylem hydraulic conductance, plant water use, biomass growth, and plant stature. Exploring the physiological and biomechanical consequences of different plant branching architectures with a model. Measuring hydraulic conductance and vulnerability to water stress in herbaceous plants
Undergraduate	Investigating diurnal patterns of hydraulic conductivity in Gambel oaks Modeling whole tree conductance. Collaboration with Brian Enquist (University of Arizona) and Van Savage (University of California - Los Angeles) to revise West, Brown, Enquist (WBE) model in plants Tested resistance of inter-conduit pits to air-seeding

Publications

[1] D. D. Smith, J. S. Sperry, and F. R. Adler. Convergence in leaf size vs twig leaf area scaling: Do plants optimize leaf area partitioning? *in prep.*

[2] D. D. Smith and J. S. Sperry. Coordination between water transport capacity, biomass growth, metabolic scaling and species stature in co-occurring shrub and tree species. *Plant, Cell & Environment*, 37(12):2679–2690, 2014.

[3] D. D. Smith, J. S. Sperry, B. J. Enquist, V. M. Savage, K. A. McCulloh, and L. P. Bentley. Deviation from symmetrically self-similar branching in trees predicts altered hydraulics, mechanics, light interception and metabolic scaling. *New Phytologist*, 201:217–229, 2014.

[4] L. P. Bentley, J. C. Stegen, V. M. Savage, D. D. Smith, E. I. von Allmen, J. S. Sperry, P. B. Reich, and B. J. Enquist. An empirical assessment of tree branching networks and implications for plant allometric scaling models. *Ecology Letters*, 16:1069–1078, 2013.

[5] J. S. Sperry, D. D. Smith, V. M. Savage, B. J. Enquist, K. A. McCulloh, P. B. Reich, L. P. Bentley, and E. I. von Allmen. A species' specific model of the hydraulic and metabolic allometry of trees i: model description, predictions across functional types, and implications for inter-specific scaling. *Functional Ecology*, 26:1054–1065, 2012.

[6] E. I. von Allmen, J. S. Sperry, D. D. Smith, V. M. Savage, P. B. Reich, B. J. Enquist, and L. P. Bentley. A species' specific model of the hydraulic and metabolic allometry of trees ii: testing predictions of water use and growth scaling in species with contrasting hydraulic traits. *Functional Ecology*, 26:1066–1076, 2012.

[7] M. A. Christman, J. S. Sperry, and D. D. Smith. Rare pits, large vessels, and extreme vulnerability to cavitation in a ring-porous tree species. *New Phytologist*, 193:713–720, 2012.

[8] J. S. Sperry, M. A. Christman, J. M. Torres-Ruiz, H. Taneda, and D. D. Smith. Vulnerability curves by centrifugation: is there an open vessel artifact, and are "r" shaped curves necessarily invalid? *Plant Cell and Environment*, 35:601–610, 2012.

[9] W. R. L. Anderegg, J. A. Berry, D. D. Smith, J. S. Sperry, L. D. L. Anderegg, and C. B. Field. The roles of hydraulic and carbon stress in a widespread climate-induced forest die-off. *Proceedings of the National Academy of Sciences of the United States of America*, 109:233–237, 2012.

[10] V. M. Savage, L. P. Bentley, B. J. Enquist, J. S. Sperry, D. D. Smith, P. B. Reich, and E. I. von Allmen. Hydraulic trade-offs and space filling enable better predictions of vascular structure and function in plants. *Proceedings of the National Academy of Sciences of the United States of America*, 107:22722–22727, 2010.

Conference Presentations

[1] D. D. Smith and J. S. Sperry. Coordinating growth and water transport within and across woody plant species. Ecological Society of America, 2014.

[2] D. D. Smith, J. S. Sperry, B. J. Enquist, L. P. Bentley, V. M. Savage, and P. B. Reich. Deviation from self-similar and symmetric branching alters predictions of metabolic scaling for trees. Gordon Research Conference - Metabolic Basis of Ecology, 2012.

[3] J. S. Sperry, D. D. Smith, E. I. von Allmen, B. J. Enquist, V. M. Savage, and L. Patrick. Integrating vascular principles into a general model for the structure and function of plant networks. Botanical Society of America, 2009.

Service

Journal referee: Annals of Botany; Flora; Forests; Plant, Cell & Environment, Tree Physiology (2013-present)
Retention Promotion Tenure graduate committee (2013)
Raptor nest monitoring for RINS (Raptor Inventory Nest Survey) (2011-2014)
Botany field trip for RINS volunteers. I led the trip and produced teaching materials (2014)

Awards

2015 George R. Riser Award for Outstanding Graduate Research
2009 Biology Dept. best NSF GRFP proposal
2004-2008 Honors at Entrance scholarship